

# A Review of Amino Acids



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This brief tutorial covers the chemical and structural properties of the 20 Amino Acids commonly found in proteins.

The tutorial contains a number of graphic images, it may take a while to download, so please be patient. After reviewing the amino acids, try out the Interactive Quiz. ☺

**Note:** The quiz requires a browser that recognises Frames and JavaScript, for example - Netscape Navigator 2.0 or above.

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## Amino Acid Properties

Amino acids are the basic structural units of proteins. An alpha-amino acid consists of an amino group, a carboxyl group, a hydrogen atom, and a distinctive R group bonded to a carbon atom, which is called the alpha-carbon because it is adjacent to the carboxyl (acidic) group. An R group is referred to as a *side chain*. (Stryer, 1988)

Amino Acids are commonly classified into the following groups based on the chemical and/or structural properties of their *side chains* :

- Aliphatic Amino Acids
- A Cyclic Amino Acid
- AAs with Hydroxyl or Sulfur-containing side chains
- Aromatic Amino Acids
- Basic Amino Acids
- Acidic Amino Acids and their Amides

## Amino Acid Structures

To view the amino acid structures using Rasmol click on the appropriate amino acid images below. A script is available (aacolors) to color the molecules as per the image.

When you are finished viewing the amino acid, type

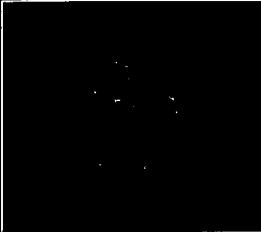
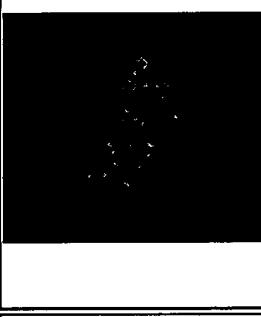
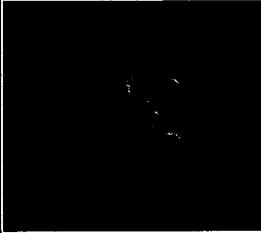
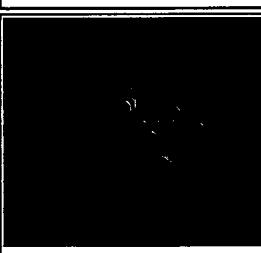
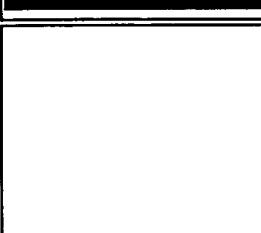
**zap (enter)**

in the command line window to close the current molecule before selecting another amino acid for

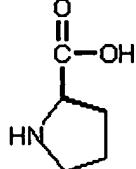
viewing. Quit the Rasmol application by typing

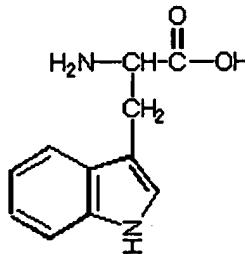
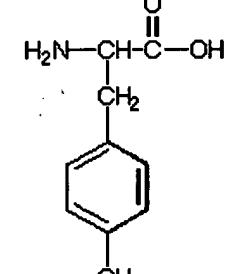
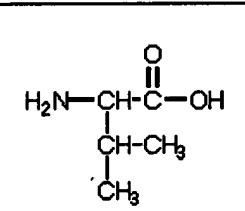
**exit (enter)**

in the command line window. Consult the online [Rasmol Manual](#) if you need further help using Rasmol.

Rasmol Image	Amino Acid	3-letter code	1-letter code	Properties	Structure (un-ionised form)
	Alanine	Ala	A	aliphatic hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{CH}_3)-\text{C}(=\text{O})-\text{OH}$
	Arginine	Arg	R	polar hydrophilic charged (+)	$\text{H}_2\text{N}-\text{CH}(\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}-\text{C}(=\text{NH})-\text{NH}_2)-\text{C}(=\text{O})-\text{OH}$
	Asparagine	Asn	N	polar hydrophilic neutral	$\text{H}_2\text{N}-\text{CH}(\text{CH}_2\text{C}(=\text{O})-\text{NH}_2)-\text{C}(=\text{O})-\text{OH}$
	Aspartate	Asp	D	polar hydrophilic charged (-)	$\text{H}_2\text{N}-\text{CH}(\text{CH}_2\text{C}(=\text{O})-\text{OH})-\text{C}(=\text{O})-\text{OH}$
	Cysteine	Cys	C	polar hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{CH}_2\text{SH})-\text{C}(=\text{O})-\text{OH}$
	Glutamine	Gln	Q	polar hydrophilic neutral	

					$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{NH}_2$
	Glutamate	Glu	E	polar hydrophilic charged (-)	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{CH}_2-\text{C}(=\text{O})-\text{OH}$
	Glycine	Gly	G	aliphatic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{H}$
	Histidine	His	H	aromatic polar hydrophilic charged (+)	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-$ 
	Isoleucine	Ile	I	aliphatic hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CH}_2-\text{CH}_3$
	Leucine	Leu	L	aliphatic hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{CH}(\text{CH}_3)-\text{CH}_3$
	Lysine	Lys	K	polar hydrophilic charged (+)	

					$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$
	Methionine	Met	M	hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{S}-\text{CH}_3$
	Phenylalanine	Phe	F	aromatic hydrophobic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{C}_6\text{H}_5$
	Proline	Pro	P	hydrophobic neutral	
	Serine	Ser	S	polar hydrophilic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}_2-\text{OH}$
	Threonine	Thr	T	polar hydrophilic neutral	$\text{H}_2\text{N}-\text{CH}(\text{C}(=\text{O})\text{OH})-\text{CH}(\text{OH})-\text{CH}_3$
	Tryptophan	Trp	W	aromatic hydrophobic neutral	

					
	Tyrosine	Tyr	Y	aromatic polar hydrophobic	
	Valine	Val	V	aliphatic hydrophobic neutral	

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